IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of

RICHARD M. WEBER ET AL.

Serial No. 08/675,280 (TI-19646.1)

Filed July 1, 1996

For: CONSTRUCTION OF PHASE CHANGE MATERIAL EMBEDDED ELECTRONIC CIRCUIT BOARDS AND ELECTRONIC CIRCUIT BOARD ASSEMBLIES USING POROUS AND FIBROUS MEDIA

Art Unit 3407

Examiner C. Atkinson

#15
7-7
10-3-97

Assistant Commissioner for Patents
Washington, D. C. 20231

Sir:

BRIEF ON APPEAL

REAL PARTY IN INTEREST

The real party in interest is Texas Instruments Incorporated, a Delaware corporation with principal offices at 13500 North Central Expressway, Dallas, Texas 75265.

RELATED APPEALS AND INTERFERENCES

There are no known related appeals and/or interferences.

STATUS OF CLAIMS

This is an appeal of the final rejection of claims 1, 2, 7, 8 and 17 to 22, all of the rejected claims. Claims 3, 4, 9, 10 and 13 to 16 were canceled during prosecution and the appeal as to

claims 5, 6, 11, 12, 23 and 24 is withdrawn. Please charge any costs to Deposit Account No. 20-0668.

STATUS OF AMENDMENTS

No amendment has been filed subsequent to the final rejection.

SUMMARY OF INVENTION

The invention, as shown in FIGURE 2, relates to a heat sink which includes an enclosure (shown in FIGURE 3) having a highly thermally conductive surface region composed of a composite of highly thermally conductive fibers 11, 13 disposed to provide a matrix 11 with fibers 13 extending therefrom into a cavity having phase change material (PCM) 15 therein. The enclosure including the highly thermally conductive surface region defines an enclosed cavity. A plurality of the fibers 13 extend externally of the matrix and into the cavity to provide a porous, highly thermally conductive material integral with and thermally coupled to the highly thermally conductive surface 11 and disposed in the cavity. The porous material is the plurality of thermally conductive fibers 13 extending from the matrix into the cavity. The PCM 15 is disposed in the cavity which changes from its initial phase to its final phase responsive to the absorption of heat disposed in the enclosed cavity and in the porous material. The more dense phase of the PCM is the solid phase and the less dense phase is the liquid phase. The porous material (fibers 13) is substantially

homogeneously disposed within the cavity. The fibers are preferably graphite and the PCM is preferably a wax.

ISSUES

The issues on appeal are as follows:

1. Whether claims 1, 7, 17 and 19 are patentable over Lebailly et al. in view of Kuzay under 35 U.S.C. 103.

2. Whether claims 2, 8, 18, and 20 to 22 are patentable over Lebailly et al. in view of Kuzay, further in view of Hermanns et al.

GROUPING OF CLAIMS

The claims do not stand or fall together for reasons presented hereinbelow under ARGUMENT.

ARGUMENT

ISSUE 1

Claims 1, 7, 17 and 19 were rejected under 35 U.S.C. 103 as being unpatentable over Lebailly et al. in view of Kuzay. The rejection is without merit.

Claim 1, the only independent claim, requires, among other features, a heat sink which includes an enclosure having a highly thermally conductive surface region composed of a composite of highly thermally conductive fibers disposed to provide a matrix, the enclosure including the said highly thermally conductive surface region and a plurality of the fibers which provide the

matrix extending externally of the matrix and into the cavity to provide a porous, highly thermally conductive material integral with and thermally coupled to the highly thermally conductive surface, the porous material being the plurality of thermally conductive fibers extending from the matrix into the cavity. No such concept is taught or even remotely suggested by Lebailly et al., Kuzay or any proper combination of these references.

The concept of having a single matrix composed of fibers, a plurality of the fibers also extending into the cavity is nowhere taught or suggested by any of the cited references or any proper combination of the references. It is apparent that the fabrication of such a heat sink is made economically superior to the prior art since no added step is required for the purpose of attaching the porous medium to the matrix as is the case of the prior art where a porous medium is present.

The examiner altered his prior rejection in making the last Office action final by dropping the Scanlon patent and apparently alleging that Lebailly et al. discloses fibrous materials in the manner claimed herein. This is not the case. The fibers of Lebailly et al. are formed into woven material or knitted or braided metal cord, fibre flock or metallic foam as stated at column 4, lines 3ff. This is further confirmed at lines 17ff where it is stated that, when the carrier comprises a sinusoidal spacer, braided or knitted metal cords may be incorporated into the passages in the sinusoid which are then supplemented by a transverse braid covering all the ends of the cords emerging from

the passages. It is therefore clear that Lebailly et al. relates, at best, to a fabric composed of fibers and not to "a plurality of said fibers extending externally of said matrix and into said cavity to provide a porous, highly thermally conductive material integral with and thermally coupled to said highly thermally conductive surface and disposed in said cavity, said porous material being said plurality of said thermally conductive fibers extending from said matrix into said cavity". Lebailly et al. nowhere teaches or suggests the matrix with the plurality of fibers extending from the matrix into the phase change material as claimed. This deficiency in Lebailly et al. is nowhere remedied by any of the remaining art of record.

Claims 7, 17 and 19 depend from claim 1 and therefore define over Lebailly et al. in view of Kuzay for at least the reasons presented above with regard to claim 1.

Claim 7 further limits claim 1 by requiring that the porous material be substantially homogeneously disposed within the cavity. No such combination is taught or suggested by the cited references.

Claims 17 and 19 further limit claims 1 and 7 by requiring that the thermally conductive fibers be granite. No such combination is taught or suggested by the cited references.

ISSUE 2

Claims 2, 8, 18, 21 and 22 were rejected under 35 U.S.C. 103 as being unpatentable over Lebailly et al. in view of Kuzay further in view of Hermanns et al.. The rejection is without merit.

Claims 2, 8, 21 and 24 depend from claim 1. Since Hermanns et al. in no way overcomes the deficiencies noted above with regard to Lebailly et al., these claims define over the cited references for reasons set forth above with reference to claim 1.

Claim 2 further limits claim 1 by requiring that the initial phase of the phase change material be the solid phase and the final phase be the liquid phase. No such combination is taught or suggested by the cited references.

Claim 8 further limits claim 2 by requiring that the porous material be substantially homogeneously disposed within the cavity. No such combination is taught or suggested by the cited references.

Claims 18 and 20 further limit claims 2 and 8 by requiring that the thermally conductive fibers be granite. No such combination is taught or suggested by the cited references.

Claims 21 and 22 further limit claims 1 and 2 by requiring that the phase change material be wax. No such combination is taught or suggested by the cited references.

CONCLUSIONS

For the reasons stated above, reversal of the final rejection and allowance of the claims on appeal is requested that justice be done in the premises.

Respectfully submitted,

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APPENDIX

The claims on appeal read as follows:

1. A heat sink which comprises:

(a) an enclosure having a highly thermally conductive surface region composed of a composite of highly thermally conductive fibers disposed to provide a matrix, said enclosure including said highly thermally conductive surface region defining an enclosed cavity;

(b) a plurality of said fibers extending externally of said matrix and into said cavity to provide a porous, highly thermally conductive material integral with and thermally coupled to said highly thermally conductive surface and disposed in said cavity, said porous material being said plurality of said thermally conductive fibers extending from said matrix into said cavity; and

(c) a phase change material changing from its initial phase to its final phase responsive to the absorption of heat disposed in said enclosed cavity and in said porous material.

2. The heat sink of claim 1 wherein said more dense phase of said phase change material is the solid phase and said less dense phase is the liquid phase.

7. The heat sink of claim 1 wherein said porous material is substantially homogeneously disposed within said cavity.

8. The heat sink of claim 2 wherein said porous material is substantially homogeneously disposed within said cavity.

17. The heat sink of claim 1 wherein said thermally conductive fibers are graphite.

18. The heat sink of claim 2 wherein said thermally conductive fibers are graphite.

19. The heat sink of claim 7 wherein said thermally conductive fibers are graphite.

20. The heat sink of claim 8 wherein said thermally conductive fibers are graphite.

21. The heat sink of claim 1 wherein said phase change material is a wax.

22. The heat sink of claim 2 wherein said phase change material is a wax.